



# Science Teacher Guide

*Prepared by Serenity Learning Center*

# Table of Contents

Page #

<b>Guide Overview &amp; Purpose.....</b>	<b>3</b>
Teacher's Role: A Guide on the Path of Discovery.....	3
Guiding Principles:.....	3
<b>Suggested Teaching Outline (Explorer Level):.....</b>	<b>5</b>
Introduce Main Scientific Discipline & Theme.....	5
Overview & Purpose.....	5
Focus on a Theme.....	5
Group Experiment.....	5
Discussion Summary.....	5
<b>A Note for Foundations Level Science Teachers.....</b>	<b>6</b>
OBJECTIVES - for group and individual play.....	6
<b>A Note for Scholar Level Science Mentors.....</b>	<b>7</b>
<b>I. Introduction to Science: Scientific Models, Natural Laws &amp; The Scientific Method</b>	<b>8</b>
1. What is Science?.....	8
2. A Process of Inquiry:.....	8
3. Building Knowledge Through Evidence:.....	8
4. Seeking Universal Truths:.....	8
5. A Collaborative Venture:.....	8
6. Open to Revision and Refinement:.....	8
7. Beyond the Lab:.....	9
8. Scientific Models:.....	9
9. Natural Laws:.....	9
10. The Scientific Method:.....	9
<b>II. Physics.....</b>	<b>9</b>
1. Motion and Forces:.....	9
2. Energy and Power:.....	10
3. Waves and Sound:.....	10
4. Electricity and Magnetism:.....	10
5. Light and Optics:.....	11
<b>III. Chemistry.....</b>	<b>11</b>
1. Matter and its Properties:.....	11
2. Chemical Reactions and Stoichiometry:.....	12

3. Atomic Structure and Bonding:.....	12
4. Solutions and Acids & Bases:.....	13
5. Organic Chemistry:.....	13
<b>IV. Earth Science.....</b>	<b>14</b>
1. Geology:.....	14
2. Meteorology and Climatology:.....	14
3. Oceanography:.....	15
4. Astronomy:.....	15
5. Environmental Science:.....	15
<b>V. Biology.....</b>	<b>16</b>
1. Cells and the building blocks of life:.....	16
2. Energy Transfer and Cell Processes:.....	16
3. Genetics and Heredity:.....	17
4. Evolution and Biodiversity:.....	17
5. Human Biology and Physiology:.....	17
<b>VI. Psychology.....</b>	<b>18</b>
1. Introduction to Psychology:.....	18
2. The Brain and Nervous System:.....	18
3. Sensation and Perception:.....	18
4. Learning and Memory:.....	19
5. Development and Personality:.....	19
6. Emotions and Motivation:.....	19
7. Social Psychology:.....	20
<b>VII. Human Societies: Sociology, Anthropology, and Archaeology.....</b>	<b>20</b>
1. Sociology:.....	20
2. Anthropology:.....	21
3. Archaeology:.....	21
<b>VIII. Innovation: Engineering, Technology, Futurology, and Permaculture.....</b>	<b>22</b>
1. Engineering:.....	22
2. Technology:.....	22
3. Futurology:.....	23
4. Permaculture:.....	23

## Guide Overview & Purpose

This guide empowers you to inspire young minds (8+) to actively explore and question the world around them through the methods of science. **The guide is focused on Explorer Level students** but also has sections dedicated to Foundation and Scholar Level students.

### Teacher's Role: A Guide on the Path of Discovery

- Model the scientific method:
  - a. Ask a question
  - b. Propose a solution (hypothesis)
  - c. Gather evidence (research, observation, and possibly experiment)
  - d. Analyze your evidence
  - e. Draw conclusions and propose more questions
- Spark curiosity: Fuel a love for learning by presenting insights, experiments and projects to inspire students about the universe on each scientific discipline (Physics, Chemistry, Biology, Geology, Oceanography, Meteorology, Astronomy, Engineering, Anatomy & Physiology, Health & Nutrition, Psychology, Sociology, Anthropology, Archaeology, Engineering, Futurology) and make connections to their individual interests & experiences.
- Empower independent exploration: Equip students with the skills to explore their chosen topics through research (Dictionaries, Indexes, Thesauruses, Topical Guides, recording sources) and hands-on activities (taking notes, measurement, creating models, asking more questions). Search for the "what" and "hows". Looking to discover the "why it matters" and/or "what you can do with this."
- Inspire Documentation: Nurture the skill/habit of documentation. Teach them to record and organize their data, ideas, and observations, building a valuable record of their scientific journey that they can keep and share. IE: Student science journals are a good option: for recording experiments, research findings, and personal reflections.
- Facilitate Collaboration: Encourage students to share their learnings with peers and parents, fostering collaboration and deeper understanding.

## Guiding Principles:

- Pacing and depth: Adapt to each student's learning pace and adjust exploration themes accordingly.
- Holistic/integrated exposure: Cover the full range of scientific disciplines, revisiting each one year after year to build a deeper understanding. Emphasize how the disciplines are related to each other and help the student build a holistic/integrated view of the world through the lens of science.
- Lifelong learning: Foster a passion for curiosity and independent research that extends beyond the classroom. Inspire the students to recognize and apply scientific ways of thinking and applying these skills in daily life.
- KEY: Your role is model scientist, supporter and encourager: Guide students in using scientific methods, not by providing answers but by asking prompting questions. Remember, you are not an encyclopedia! Embrace continuous learning and exploration yourself. Seek out additional resources and let your own curiosity guide your journey with your students.
- Remember: This is just a basic overview. Each topic has many subtopics and complexities. Use this guide as a starting point for further exploration and understanding.

## Suggested Teaching Outline (Explorer Level):

Introduce the Main Scientific Discipline & Theme

*Example: Chemistry- Chemical Reactions*

Overview & Purpose

*What is this and why is it useful/important?*

Focus on a Theme

*Present information and share a group study about Key Concepts of the theme for example: "The Chemistry of Combustion Reactions"*

Group Experiment

*Plan for a hands-on experience for the theme IE: example activity or experiment showing a true scientific concept. For example: What happens when ethanol is burned? Measuring the products of a combustion reaction. Show the reaction equation and demonstrate the formation of products using burning ethanol (ethanol+oxygen) covered by a clear glass jar (water+carbon dioxide.)*

Discussion Summary

*Support the students in summarizing their observations and lead a discussion to support ideas about application. Example questions - Highlight the concepts to be learned and the questions that could lead to understanding what students could do with this knowledge. For example: "How is this knowledge important in the real world?" and "What other benefit can be found from this?"*